App. No. 09/489,878
Amendment Dated: January 10, 2005
Reply to Office Action of November 10, 2004

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REMARKS/ARGUMENTS

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In the Office Action dated November 10, 2004, the Examiner rejected to Claims 1, 5, and

7 under 35 U.S.C. 112, first paragraph, as failing to comply with enablement requirements.

Claims 15, 16, 20, 21, 25, 26, 30, 31, and 54 are rejected under 35 U.S.C. 112, second paragraph,

as being indefinite for failing to particularly point out and distinctly claim the subject matter

which Applicant regards as the invention. Claim 1-36 and 52-56 are rejected under 35 U.S.C.

103(a) as being unpatentable over "Points-to Analysis in Almost Linear Time" by Bjarne

Steensgaard (hereinafter Steensgaard) in view of "Program Analysis and Specialization for the C

Programming Language" by Lars Ole Andersen (hereinafter Andersen). Claims 1, 5, 6-8, 12, 13,

15-18, 20-23, 25-28, 30-32, and 54 have been amended to clarify the subject matter. Claims 37-

51 were previously canceled. Claims 1-36 and 52-56 remain pending. No new matter has been

added by the amendments. Applicant respectfully requests reconsideration and allowance of all

pending claims.

I.   Rejections under 35 U.S.C. § 112

1.)   Claims 1, 5, and 7 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply

with the enablement requirement. The Office Action states that "it is not clear how a label is

propagated. . .such that the label of one of the two locations is a subset of the other of the two

locations". Applicant respectfully disagrees that the claims are not enabled.

Propagating a label is enabled by the specification. As stated in the specification, "the act

of making a label of a location a subset of a label of another location includes the act of

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propagating a label from one location to another location such that the subset is formed." (Specification, page 22, lines 24-26). This section of the specification relates propagation of a label with making a label of a location a subset of a label of another location. Various methods are available according to the claimed invention for forming this subset relationship. For example, the specification states, "suppose the assignment statement defines 'x = y' in the program."..."In one embodiment, the relationship defines that that the label of the pointed-to location of the variable y is a subset of the label of the pointed-to location of the variable x." (Specification, page 11, lines 23-28)

Accordingly, an assignment statement (e.g. x = y) is one exemplary method for propagating a label such that the label of the first one of the two locations is a subset of the second one of the two locations. Therefore, propagating a label is indeed supported by the specification through example, and Applicant respectfully requests withdrawal of the rejection of claims 1, 5, and 7 under 35 U.S.C. 112, first paragraph.

2.) Claims 15, 16, 20, 21, 25, 26, 30, 31, and 54 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as invention. The Office Action states that claims 15, 20, 25, and 30 recite "the first location points to the other of the two locations" and that it is unclear as to which locations they are referring. Applicant has amended claims 1, 5, 6-8, 12, 13, 15-18, 20-23, 25-28, 30-32, and 54; and respectfully submits that amended claims comply with 35 U.S.C. 112, second paragraph, and are in condition for allowance.

The Office Action further states that claims 16, 21, 26, and 31 recite "determining that the program is correctly typed; and that it is unclear what a program to be correctly typed means. Applicant has amended claims 16, 21, 26, and 31 to replace "correctly typed" with "well typed". These two terms have already been used interchangeably throughout the Specification and "well typed" has been extensively defined throughout the Specification. Applicant respectfully submits amended claims 16, 21, 26, and 31 comply with 35 U.S.C. 112, second paragraph and are in condition for allowance.

Moreover, the Office Action states that the term "about" used in claim 54 is a relative term, which renders the claim indefinite. Applicant has amended claim 54 to remove the term "about", and respectfully submits that claim 54 is in condition for allowance.

II. Rejections under 35 U.S.C. § 103

1.) Claims 1-36 and 52-56 are rejected in the Office Action under 35 U.S.C. 103(a) as being unpatentable over Steensgaard in view of Andersen. Applicant respectfully disagrees as explained below.

With regard to claim 1, amended claim 1 recites, "processing an assignment between two variables in a program, wherein processing an assignment includes forming a relationship between two locations that are related to the two variables, wherein the two locations are selected to be one level of indirection away from a level associated with the assignment". As the Office Action agrees, Steensgaard does not teach or suggest by its disclosure that the two locations are selected to be one level of indirection away from a level associated with the assignment as

described according to the claimed invention. Furthermore, Steensgaard does not teach or suggest propagating a label of the first one of the two locations to a label of the second one of the two locations such that the label of the first one of the two locations is a subset of the second one of the two locations. Andersen does not cure this deficiency of Steensgaard.

Andersen presents an inter-procedural pointer analysis by deriving a constraint-based formulation. For the proposed points-to analysis, Andersen determines a safe approximation to the set of locations the pointer may contain during program execution for every object of pointer type and for all possible input. (See Andersen, page 111, 113) Furthermore, Andersen suggests that if the program fulfills the rules in the context of a pointer abstraction S, then S is a safe pointer abstraction and the rules fail if S is not a pointer abstraction. (See Andersen, page 125)

Andersen, however, fails to teach or suggest "...forming a relationship between two locations that are related to the two variables, wherein the two locations are selected to be one level of indirection away from a level associated with the assignment..." It would not have been obvious for one skilled in the art to combine Andersen's constraint-based sub-typing rules with Steensgaard and arrive at the conclusion of selecting two locations to be one level of indirection away from a level associated with the assignment.

Furthermore, a prior art reference may be considered to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." Monarch Knitting Machinery Corp. v. Sulzer Morat GmbH (CAFC) 45 USPQ2d 1977 (3/10/1998). Andersen, by suggesting a flow-insensitive, context-sensitive, constraint-

based point-to analysis, arrives at relatively more precise results by producing small sets of information. (See Andersen, page 114, 115) However, an algorithm according to Andersen would require a prohibitively long amount of processing time. Thus, Andersen teaches away from the claimed invention.

The claimed invention selects to form a relationship between two locations that are one level of indirection away from the assignment as recited in amended claim 1. Andersen does not teach this method. Accordingly, Andersen and Steensgaard cannot be combined to teach or suggest the claimed invention, as both inventions are missing elements recited in the claims and Andersen teaches away from the claimed invention. Since the combination of Steensgaard and Andersen does not teach or suggest all of the limitations of amended claim 1, amended claim 1 is patentable over Steensgaard in view of Andersen.

With regard to claims 2-4, claims 2-4 are dependent upon claim 1. Therefore claims 2-4 are patentable over Steensgaard in view of Andersen for at least the reasons stated above.

With regard to claims 5-36, each of these claims includes, or is dependent on a claim that includes a limitation similar to the limitation recited above for amended claim 1. (e.g., claim 6 recites, "defining a relationship between two locations upon an assignment in the program, wherein the two locations are selected to be one level of indirection away from a level associated with the assignment, wherein a label of a first one of the two locations is associated with a label of a second one of the two locations". Claim 12 recites, "forming a relationship between two locations upon an assignment of a first variable and a second variable in the program, wherein the two locations are selected to be one level of indirection away from a level associated with the

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assignment, wherein the relationship defines that a label of a first of the two locations is a subset of a label of a second of the two locations".)

It has already been shown that the combination of Steeengaard and Andersen does not teach or suggest forming a relationship between two locations upon an assignment of a first variable and a second variable in the program, wherein the two locations are selectively selected to be one level of indirection away from a level associated with the assignment. Accordingly, for at least the reasons provided above regarding amended claim 1, claims 5-36 are also patentable over Steensgaard in view of Andersen.

Claim 52 recites, "establishing a plurality of flow relationships corresponding to each of the plurality of assignment statements, wherein each of the flow relationships is selected to be established one level of indirection away from each of the assignment statements". Accordingly, for at least the reasons provided above regarding amended claim 1, claim 52 and its dependent claims 53 and 54 are also patentable over Steensgaard in view of Andersen.

Similarly, claim 55 recites, "wherein another relationship is selectively formed one level of indirection away from a level associated with the assignment statement between the set of symbols related to one of the two variables and the set of symbols relating to the other of the two variables". Therefore, for at least the reasons provided above regarding amended claim 1, claim 52 and its dependent claim 56 are also patentable over Steensgaard in view of Andersen.
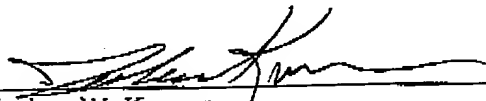
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CONCLUSION

In view of the foregoing amendments and remarks, all pending claims are believed to be

allowable and the application is in condition for allowance. Therefore, a Notice of Allowance is

respectfully requested. Should the Examiner have any further issues regarding this application,

the Examiner is requested to contact the undersigned attorney for the applicant at the telephone

number provided below.

Respectfully submitted,

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